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**From:** Gerhard, Sasha [Gerhard.Sasha@epa.gov]  
**Sent:** 2/19/2016 9:14:02 PM  
**To:** Galbraith, Michael [Galbraith.Michael@epa.gov]  
**Subject:** RE: OB/OD call

True. Good point! Not to mention that most countries are the size of a hand-full of our states.

Sasha Gerhard  
USEPA, Office of Resource Conservation & Recovery  
Program Implementation & Information Division, 5303P  
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**From:** Galbraith, Michael  
**Sent:** Friday, February 19, 2016 3:23 PM  
**To:** Gerhard, Sasha <Gerhard.Sasha@epa.gov>  
**Subject:** Re: OB/OD call

\$. maybe other countries prioritize things differently since they don't have the burden of acting as the worlds police/superpower (whether right or wrong).

Mike Galbraith  
Permits Branch (5303P)  
Program Implementation/Information Division  
Office of Resource Conservation and Recovery  
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1200 Pennsylvania Avenue, NW  
Washington, DC 20460

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**From:** Gerhard, Sasha  
**Sent:** Friday, February 19, 2016 2:36 PM  
**To:** Galbraith, Michael  
**Subject:** RE: OB/OD call

Thanks. Why is the US always behind when it comes to these type of issues?!

Sasha Gerhard  
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**From:** Galbraith, Michael  
**Sent:** Friday, February 19, 2016 2:26 PM  
**To:** Gerhard, Sasha <Gerhard.Sasha@epa.gov>  
**Subject:** Fw: OB/OD call

Mike Galbraith  
Permits Branch (5303P)  
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**From:** Craig, Harry

**Sent:** Friday, February 19, 2016 2:16 PM

**To:** Walsh, Michael ERDC-RDE-CRREL-NH CIV; Gullett, Brian

**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH CIV; Taylor, Susan ERDC-RDE-CRREL-NH CIV; Galbraith, Michael; Shuster, Kenneth; Palumbo, Janice; Halstead, Sandra; Maddox, Doug; Leeson, Andrea CIV (US); Hendrickson, Charles; Thomas F Hall; Vazquez, Julio; Moyer, Desiree; Dolan, Jane; Tom Jenkins

**Personal Email / Ex. 6**

**Subject:** RE: OB/OD call

Mike,

Probably worth noting that explosives are absorbed by the ingestion, inhalation, and dermal exposure pathways. Another reason why soil contamination is a concern with regard to risk assessment. Some of the other countries have used biomonitoring as the basis for assessing TNT exposure from dismantling ammo and waste site cleanup. I suspect that the EOD technicians are not on any type of medical monitoring program to assess potential occupational exposure.

Regards,

Harry

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**From:** Walsh, Michael ERDC-RDE-CRREL-NH CIV [<mailto:Michael.Walsh@erdc.dren.mil>]

**Sent:** Tuesday, February 16, 2016 8:36 AM

**To:** Craig, Harry <[Craig.Harry@epa.gov](mailto:Craig.Harry@epa.gov)>; Gullett, Brian <[Gullett.Brian@epa.gov](mailto:Gullett.Brian@epa.gov)>

**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH CIV <[Marianne.E.Walsh@erdc.dren.mil](mailto:Marianne.E.Walsh@erdc.dren.mil)>; Taylor, Susan ERDC-RDE-CRREL-NH CIV <[Susan.Taylor@erdc.dren.mil](mailto:Susan.Taylor@erdc.dren.mil)>; Galbraith, Michael <[Galbraith.Michael@epa.gov](mailto:Galbraith.Michael@epa.gov)>; Shuster, Kenneth <[Shuster.Kenneth@epa.gov](mailto:Shuster.Kenneth@epa.gov)>; Palumbo, Janice <[Palumbo.Jan@epa.gov](mailto:Palumbo.Jan@epa.gov)>; Halstead, Sandra <[Halstead.Sandra@epa.gov](mailto:Halstead.Sandra@epa.gov)>; Maddox, Doug <[Maddox.Doug@epa.gov](mailto:Maddox.Doug@epa.gov)>; Leeson, Andrea CIV (US) <[andrea.leeson.civ@mail.mil](mailto:andrea.leeson.civ@mail.mil)>; Hendrickson, Charles <[hendrickson.charles@epa.gov](mailto:hendrickson.charles@epa.gov)>; Thomas F Hall <[TFHall1@swbell.net](mailto:TFHall1@swbell.net)>; Vazquez, Julio <[Vazquez.Julio@epa.gov](mailto:Vazquez.Julio@epa.gov)>; Moyer, Desiree <[Moyer.Desiree@epa.gov](mailto:Moyer.Desiree@epa.gov)>; Dolan, Jane <[Dolan.Jane@epa.gov](mailto:Dolan.Jane@epa.gov)>; Tom Jenkins

(**Personal Email / Ex. 6**)

**Subject:** Re: OB/OD call

We (CRREL) has looked into the OB of excess propellants. Burn sites, including both burn-on-ground and legacy burn pans, are quite contaminated with both energetics and lead. The lead is especially worrisome, as it was aerosolized before ejection from the pan (very fine particles.)

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On 1/26/16, 12:19 PM, "Craig, Harry" <[Craig.Harry@epa.gov](mailto:Craig.Harry@epa.gov)> wrote:

Brian,

The problem is on historical OB/OD sites the record keeping and historical records on these types of sites is poor to non-existent. DOD was not required to keep detailed records on what they disposed of and didn't. Therefore, what we need is robust site characterization technologies to find out what is present at these sites because the lack of historical records cannot be used as the basis for what is subsurface, in soil and in groundwater.

Geophysics is improving considerably, but often the metal density at OD units is so high that the geophysics is saturated, and requires "dig and sieve" to remove the metal from soils, separate the metal fragmentation from the intact rounds, as well as sieve out bulk explosives from low order detonations from the contaminated soils. A real world example on this is at Umatilla Army Depot in OR, the Army will be required to sieve 355 acres to one foot deep, which is 500,000 cubic yards of material as just the 1<sup>st</sup> step in material handling. Similar types of requirements have also existed at the OB/OD sites at Ft. Wingate in NM.

Historically, they also used to burn directly on the ground and not on above ground burn trays, so the newer burn tray combustion efficiency of OB cannot be equated to historical burn on the ground practices. On historical OB/OD sites, we are looking for cumulative effects of years or even decades of use, so there was likely a wide range of combustion efficiencies based on the way OB/OD was actually practiced in the field. Based on years of research, Method 8330B provides a robust methodology to assess soil, sediment, and groundwater contamination if followed correctly, particularly related to soil sampling.

I would suggest site visits to MMR Demo 1 in MA, Seneca Army Depot in NY, Ft. Wingate in NM, Umatilla in OR, Bangor Site A in WA, and Ft. Wainwright in AK if you would like to see a good cross section of the type of historical OB/OD sites that EPA deals with from a cleanup and remediation standpoint.

Regards,

Harry

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**From:** Gullett, Brian

**Sent:** Tuesday, January 26, 2016 4:34 AM

**To:** Craig, Harry <[Craig.Harry@epa.gov](mailto:Craig.Harry@epa.gov)>

**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH <[Marianne.E.Walsh@erdc.dren.mil](mailto:Marianne.E.Walsh@erdc.dren.mil)>; Taylor, Susan ERDC-RDE-CRREL-NH <[Susan.Taylor@erdc.dren.mil](mailto:Susan.Taylor@erdc.dren.mil)>; Galbraith, Michael <[Galbraith.Michael@epa.gov](mailto:Galbraith.Michael@epa.gov)>; Shuster, Kenneth <[Shuster.Kenneth@epa.gov](mailto:Shuster.Kenneth@epa.gov)>; Walsh, Michael ERDC-RDE-CRREL-NH <[Michael.Walsh@erdc.dren.mil](mailto:Michael.Walsh@erdc.dren.mil)>; Palumbo, Janice <[Palumbo.Jan@epa.gov](mailto:Palumbo.Jan@epa.gov)>; Halstead, Sandra <[Halstead.Sandra@epa.gov](mailto:Halstead.Sandra@epa.gov)>; Maddox, Doug <[Maddox.Doug@epa.gov](mailto:Maddox.Doug@epa.gov)>; Leeson, Andrea CIV (US) <[andrea.leeson.civ@mail.mil](mailto:andrea.leeson.civ@mail.mil)>

**Subject:** RE: OB/OD call

Harry,

I agree that a comprehensive approach makes sense. I believe this is might be much more of an issue from OD than OB; the 100's of OB I've sampled have burned very well and the burn pans contained virtually no residue.

For FY16 SERDP solicited proposals for potential contamination from low-order detonations; this may address some of the issues you raise. For other issues, may I suggest you work through Doug Maddox, EPA's Munitions representative on SERDP, to propose new Statements of Need?

Brian

Brian K. Gullett, Ph.D.

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**From:** Craig, Harry  
**Sent:** Monday, January 25, 2016 1:48 PM  
**To:** Gullett, Brian <[Gullett.Brian@epa.gov](mailto:Gullett.Brian@epa.gov)>  
**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH <[Marianne.E.Walsh@erdc.dren.mil](mailto:Marianne.E.Walsh@erdc.dren.mil)>; Taylor, Susan ERDC-RDE-CRREL-NH <[Susan.Taylor@erdc.dren.mil](mailto:Susan.Taylor@erdc.dren.mil)>; Galbraith, Michael <[Galbraith.Michael@epa.gov](mailto:Galbraith.Michael@epa.gov)>; Shuster, Kenneth <[Shuster.Kenneth@epa.gov](mailto:Shuster.Kenneth@epa.gov)>; Walsh, Michael ERDC-RDE-CRREL-NH <[Michael.Walsh@erdc.dren.mil](mailto:Michael.Walsh@erdc.dren.mil)>; Palumbo, Janice <[Palumbo.Jan@epa.gov](mailto:Palumbo.Jan@epa.gov)>; Halstead, Sandra <[Halstead.Sandra@epa.gov](mailto:Halstead.Sandra@epa.gov)>; Maddox, Doug <[Maddox.Doug@epa.gov](mailto:Maddox.Doug@epa.gov)>  
**Subject:** RE: OB/OD call

Brian,

In the field we have had to deal with the soil heterogeneity issue for explosives for the last 20 years. The initial attempts were to use a higher density grid sampling with field analytical methods, which still has some validity. The most current state of the art is MIS sampling and lab procedures in Method 8330B to deal with the heterogeneity issues. I've worked with the CRREL folks (Tom Jenkins, the late Alan Hewitt, Marianne, and Susan Taylor) for a long time.

It would be good to have SERDP/ESTCP fund more work to get complete mass balances (air, soil, and groundwater) for emissions from OB/OD operations. The longest term effects and the most expensive part of cleanup for OB/OD units are usually the massive amounts of metal remaining subsurface, soil contamination, and groundwater contamination.

Regards,

Harry

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**From:** Gullett, Brian  
**Sent:** Monday, January 25, 2016 7:56 AM  
**To:** Craig, Harry <[Craig.Harry@epa.gov](mailto:Craig.Harry@epa.gov)>  
**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH <[Marianne.E.Walsh@erdc.dren.mil](mailto:Marianne.E.Walsh@erdc.dren.mil)>; Taylor, Susan ERDC-RDE-CRREL-NH <[Susan.Taylor@erdc.dren.mil](mailto:Susan.Taylor@erdc.dren.mil)>; Galbraith, Michael <[Galbraith.Michael@epa.gov](mailto:Galbraith.Michael@epa.gov)>; Shuster, Kenneth <[Shuster.Kenneth@epa.gov](mailto:Shuster.Kenneth@epa.gov)>; Walsh, Michael ERDC-RDE-CRREL-NH <[Michael.Walsh@erdc.dren.mil](mailto:Michael.Walsh@erdc.dren.mil)>  
**Subject:** RE: OB/OD call

Harry,

Thanks for your comments.

Our three SERDP projects (links sent last week) were established to determine emission measurement methods and emission factors so there was no focus on soil contamination. The limited soil sampling reported in the 2015 journal article was an initial attempt to see whether soil metals could be subtracted from the particulate matter metals to determine ordnance-originated metal emissions. It was not meant to be a comprehensive soil analysis – a point which maybe was not sufficiently made in the article.

We have paired with the Army Corps at CRREL (I see you have cc'd Marianne Walsh on your emails) to do concurrent air emission and snow surface sampling. This preliminary work was done last February in Anchorage; we hope to continue this effort but funding has not seemed to materialize.

Thanks for these documents; hopefully we'll get the chance to do a more comprehensive air and soil effort.

Brian

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**From:** Craig, Harry  
**Sent:** Thursday, January 21, 2016 1:45 PM  
**To:** Shuster, Kenneth <[Shuster.Kenneth@epa.gov](mailto:Shuster.Kenneth@epa.gov)>; Gullett, Brian <[Gullett.Brian@epa.gov](mailto:Gullett.Brian@epa.gov)>  
**Cc:** Walsh, Marianne E ERDC-RDE-CRREL-NH <[Marianne.E.Walsh@erdc.dren.mil](mailto:Marianne.E.Walsh@erdc.dren.mil)>; Taylor, Susan ERDC-RDE-CRREL-NH <[Susan.Taylor@erdc.dren.mil](mailto:Susan.Taylor@erdc.dren.mil)>  
**Subject:** RE: OB/OD call

Ken, Brian,

Based on review of the 2015 journal article, there appears to be very limited soil sampling. The sampling methods using about a 5 sample composite would substantially not meet the sampling design objectives in the current EPA Method 8330B Appendix A for explosives and propellant analysis. Explosives and propellants in soil exhibit extreme heterogeneity and as such, need a large amount of increments to adequately characterize a specific soil area using an Multi-Increment Sampling (MIS) approach. Attached is a study comparing 5 composite samples vs. MIS approach with 30 or greater increments. A large number of increments (> 30) and laboratory grinding of the soil samples are requirements of the current EPA Method 8330B.

Here is the link to the current EPA Guidance document on sampling design for explosives in soil:

[Blockedhttp://www.epa.gov/sites/production/files/documents/site\\_characterization\\_for\\_munitions\\_constituents.pdf](http://www.epa.gov/sites/production/files/documents/site_characterization_for_munitions_constituents.pdf)Blocked

Dr. Tom Jenkins' webinar is also a good overview of the issues related to soil sampling for explosives:

[Blockedhttps://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/05-28-2015](https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/05-28-2015)Blocked

Regards,

Harry

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**From:** Shuster, Kenneth  
**Sent:** Wednesday, January 20, 2016 12:16 PM

**To:** Gullett, Brian <Gullett.Brian@epa.gov>

**Cc:** Craig, Harry <Craig.Harry@epa.gov>; Galbraith, Michael <Galbraith.Michael@epa.gov>; Gaines, Jeff <Gaines.Jeff@epa.gov>; Crosby-Vega, Terri <Crosby-Vega.Terri@epa.gov>; Gerhard, Sasha <Gerhard.Sasha@epa.gov>; Kohler, Amanda <Kohler.Amanda@epa.gov>; Gervais, Gregory <Gervais.Gregory@epa.gov>; Anderson, RobinM <Anderson.RobinM@epa.gov>; Gaines, Jeff <Gaines.Jeff@epa.gov>; Abdul-Malik, Norma <Abdul-Malik.Norma@epa.gov>; Sasseville, Sonya <Sasseville.Sonya@epa.gov>; Wilson, Michaelle <Wilson.Michaelle@epa.gov>; Wanslow, Julie <Wanslow.Julie@epa.gov>

**Subject:** FW: OB/OD call

Thanks Brian. I'm forwarding these on to key EPA people working on this issue. Please keep me informed on the Radford tests. I hope to find the time to get comments to you, but don't hold your breath.

All,

These are reports on Brian Gullett (EPA) et al's efforts to develop testing protocol and emissions factors to fill the void for OB/OD of energetics.

Ken

Personal Phone / Ex. 6

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**From:** Gullett, Brian

**Sent:** Wednesday, January 20, 2016 12:30 PM

**To:** Shuster, Kenneth <Shuster.Kenneth@epa.gov>

**Subject:** OB/OD call

Ken,

It was good to meet you via the conference call today and I look forward to speaking with you again. I think you have the latest paper on OB/OD (Aurell et al., J. Haz. Mat.) and I've also attached one of our earlier papers that talks about the sampling method (Chemosphere). The SERDP reports can be found at [Blockedwww.serdp.orgBlocked](http://www.serdp.org) or:

[Blockedhttps://www.serdp-estcp.org/Program-Areas/Weapons-Systems-and-Platforms/Energetic-Materials-and-Munitions/Munitions-Emissions/WP-2233/WP-2233/\(language\)/eng-USBlocked](https://www.serdp-estcp.org/Program-Areas/Weapons-Systems-and-Platforms/Energetic-Materials-and-Munitions/Munitions-Emissions/WP-2233/WP-2233/(language)/eng-USBlocked)

[Blockedhttps://www.serdp-estcp.org/content/download/9560/122378/file/WP-1672-FR.pdfBlocked](https://www.serdp-estcp.org/content/download/9560/122378/file/WP-1672-FR.pdfBlocked)

[Blockedhttps://www.serdp-estcp.org/content/download/15568/177130/file/WP-2153-FR.pdfBlocked](https://www.serdp-estcp.org/content/download/15568/177130/file/WP-2153-FR.pdfBlocked)

You'll also note that the main SERDP web site shows a lot of research related to partial detonations, range issues, etc.

I'm interested in your thoughts on these reports and our methods.

Thanks!

Brian

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